April 2000

MAINTENANCE BULLETIN

Alfa Company

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You are invited to send your ideas for, improving maintenance procedures, suggestions for articles, or comments on material published in the Maintenance Bulletin. Just write to the address below:
Officer in Charge, NAVFACENGCOMDET,

SEABEE LOGISTICS CENTER

1000 23RD Avenue
Building 1000
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Running Gear Wrap-Up HMMWV

Will the transmission on a basic model M998 work on a M998A2? Will the front prop shaft on an M998A2 work on an M1114? Will the engine from an M998A1 work in a basic M998?

Questions like these are common these days, since the HMMWV has so many different models and series in the field. There are the original M998 series trucks; the M998-A1 series; the M998-A2 series, the M1113 and M1114 models.

To keep things straight in the maintenance bay, here's what each series of models uses for running gear:

Basic M998 series:

Engine:
6.2L pre-1990, NSN 2815-01-231-3672 used on serial numbers 1 – 99,999.
6.2L post-1990, NSN 2815-01-314-7940 used on serial numbers 100,000 and above.
6.5L detuned, NSN 2815-01-406-6675 used on 1996 models.
6.5L detuned, NSN 2815-01-439-6664 used on 1997 models.
Transmission:
3L80E, NSN 2520-01-161-2136
Transfer case:
218 model, NSN 2520-01-163-4999 or
242 model, NSN 2520-01-409-2512.
Conversion kit, NSN 2520-01-434-0822 installs the 242 model (slip type yoke) in trucks once the 218 model (bolt type flange) is no longer available.
Front prop shaft (off front axle differential):
NSN 2520-01-200-3097, U-joint repair kit NSN 2520-00-722-7074, contains cross assembly, retaining rings and bearing race caps.
Front prop shaft (off transfer):
With 218 model transfer case installed, NSN 2520-01-200-3096. U-joint repair kit NSN 2520-00-722-7074.
With 242 model transfer case installed, NSN 2520-01-357-5043. U-joint repair kit NSN 2520-01-189-2135.
Rear prop shaft:
With 218 model transfer case installed on trucks serial numbered 1 – 44,824 with out parking brake MWO 9-2320-280-35-1 applied, NSN 2520-01-171-8258.
With 218 model transfer case installed on trucks serial numbered 44,825 and above or with parking brake MWO 9-2320-280-35-1 applied, NSN 2520-01-346-1374.
With 242 model transfer case installed, NSN 2520-01-459-0050. U-joint repair kit, NSN 2520-01-189-2135 for all rear shafts.

M1097 and M998A1 Series

Engine and container:
6.2L post 1990, NSN 2815-01-314-7940.
6.5L detuned, NSN 2815-01-406-6675 used on 1996 models.
6.5L detuned, NSN 2815-01-439-6664 used on 1997 models.

Transmission:
3L80E, NSN 2520-01-161-2136.
Transfer Case:
242 model, NSN 2520-01-356-9197 or 2520-01-452-8365.
Front prop shaft (off front axle differential):
NSN 2520-01-356-9189, U-joint repair kit NSN 2520-01-189-2135.
Front prop shaft (off transfer):
NSN 2520-01-357-5043. U-joint repair kit NSN 2520-01-189-2135.

Rear prop shaft:
NSN 2520-01-357-5044. U-joint repair kit, NSN 2520-01189-2135.

M998A2 series

Engine and container:
6.5L naturally aspirated, NSN 2815-01-410-9710 used on 1996 models.
6.5L naturally aspirated, NSN 2815-01-439-6665 used on 1997 models.
Transmission:
4L80E, NSN 2520-01-430-5294 used on 1996 model or NSN 2520-01-439-6830 used on 1997 model.
Transfer Case:
242 model, NSN 2520-01-409-2512.
Front prop shaft (off front axle differential):
NSN 2520-01-423-5120, U-joint repair kit NSN 2520-01-189-2135.
Front prop shaft (off transfer):
NSN 2520-01-413-0080. U-joint repair kit NSN 2520-01-189-2135.
Rear prop shaft:
NSN 2520-01-424-0425. U-joint repair kit, NSN 2520-01-359-8444.

M1113 and M1114 series

Engine and container:
6.5L turbo, NSN 2815-01-420-4180 used on 1996 models.
6.5L turbo, NSN 2815-01-439-8164 used on 1997 models.

Transmission:
4L80E, NSN 2520-01-430-2765 used on 1996 model or NSN 2520-01-439-6831 used on 1997 model.
Transfer Case:
242 model, NSN 2520-01-409-2512.
Front prop shaft (off front axle differential):
NSN 2520-01-423-5120, U-joint repair kit NSN 2520-01-189-2135.
Front prop shaft (off transfer):
NSN 2520-01-413-0080. U-joint repair kit NSN 2520-01-189-2135.

Rear prop shaft:
NSN 2520-01-424-0425. U-joint repair kit, NSN 2520-01-359-8444.

Don’t Squash the Cap HMMWV

It’s a little thing, drivers and mechanics, but if the air cleaner weather cap on your HMMWV is pushed down too far, snow and ice that accumulates around the cap will cut of the airflow through the cap to the engine.

Check the weather cap to see how high it sits above the air intake duct. If the cap is right down on the duct, grasp it with both hands and pull it up.

Leave about two inches between the duct and the bottom of the cap. That will keep the air flowing. In heavy snow, of course, you’ll need to remove the stuff as it piles up to prevent ice from forming in the filter.

Save Your Slave Cover HMMWV

When temperatures drop, the plastic cover on your vehicle’s slave receptacle starts to shrink. That shrinkage makes the cover stick like glue to the receptacle. A screwdriver will pry it off, but that often breaks the cover.

Make sure it doesn’t stick in the first place by adding a thin layer of waterless hand cleaner NSN 8520-00-965-2109, to the inside of the cover. That will keep it slick enough to let the cap come off easily in any weather.

Stop Exhaust Manifold Breaks HMMWV

It’s a tough job but you can mount the exhaust manifolds on a HMMWV engine right and in one piece.

Make sure you have enough room to work so the manifold can be mounted properly on the engine head. Remove everything the TM tells you to remove. Working in tight spaces can create leaks and broken flanges as you try to make things fit where there is no room.

Clean the head mounting surface and the manifold mating surface. Remove all traces of old gasket material. Leftover gasket material leads to seal leaks and a repeat job you don’t need.

Finger-tighten all screws and the alternator stud, and then torque them to 25 – 33 lb-ft. Alternate the screw and stud tightening. This reduces the strain on manifold flanges and prevents leaks. Flanges often break when each screw is tightened completely before others are snugged up.

HUB AIR SEAL INSTALLATION M939A2 SERIES

If you can’t keep air in a CTIS equipped wheel after you’ve done hub repair or maintenance on you M939A2 series truck, you probably installed one or both air seals backwards.

Putting either of the two seals in backward lets air escape through the wheel. The trouble is that the seals don’t look much different from side to side, making it easy to install them backward, if you don’t know what to look for. The key to correct installation is one side of the seal has NON-PRESSURE SIDE imprinted in the rubber.

The TM installation instructions tell you to use the long end of the air seal installer to install an air seal with the spring facing out. This spring, which gives the seal its shape, is often hard to see. Just remember that the spring side is opposite form the imprint non-pressure side. For this first seal, the imprinted side should face away from you when it’s seated.

The second air seal is installed with the short end of the installer. For this seal, the imprinted side must face toward you when it’s seated.

SUBJECT: MAINTENANCE ADVISORY MESSAGE (MAM), TACOM CONTROL NO. MAM-00-003, FOR ALL M998 SERIES HIGH MOBILITY MULTIPURPOSE WHEELED VEHICLES (HMMWV)

1. Distribution: this is a "maintenance advisory message. Request MACOM commanders retransmit this message to all subordinate commands/activities.
2. Issue: the glow plug controller (GPC) NSN 2920-01-175-7214 is improved by the addition of a voltage compensating feature that prevents early glow plug failure. GCP'S with this feature can be identified by the gray colored connector and the serial number 451972 and higher.
3. A previous message instructed personnel to replace the protective control box (PCB) with a distribution box if the GCP failed. Disregard that information and discontinue any such practice. Changes have been incorporated into the GCP that change the way it functions. The changes allow the GPC to sense available voltage and adjust glow plug on time accordingly. A time out feature was also added to prevent reenergizing the pre-glow cycle before the glow plugs have sufficient time to cool. Incorporating these two features has extended glow plug life.
4. GPC'S that have the new features can be readily identified by the gray color of the electrical connector and or the serial number 451972 or higher on the manufacturers label. In preparation for the upcoming winter, units that normally experience high usage of glow plugs are strongly encouraged to replace the GPC with a voltage sensitive GPC.
5. User actions: maintenance personnel are reminded to perform glow plug troubleshooting whenever a vehicle is reported to run rough at cold idle, have excessive black smoke when cold, or hard starting. If troubleshooting indicates failure of the GPC then replace the GPC rather than the PCB and or other serviceable component.
6. Unit commanders, contact your local TACOM logistics assistance representative (LAR) or your state surface maintenance manager upon receipt of this message for assistance. If you do not know who your TACOM LAR is for CONUS call DSN 367-6204/6293, for Germany call DSN 375-6128/7436 and for Korea call DSN 315-722-3036/3881. LARS are available to help you.
7. TACOM actions: the technical manuals currently contain adequate troubleshooting and maintenance instruction. The NSN for the controller has not changed; however, the connector color was changed to gray for identification of the voltage sensitive controller.

SAFETY RECALL CAMPAIGNS

CARS, VANS, LIGHT DUTY TRUCKS
DaimlerChrysler
Models:
Chrysler Town and Country **Years:** 1991 and 1993-1994
Dodge Caravan/Grand Caravan **Years:** 1991 and 1993-1994
Plymouth Voyager/Grand Voyager **Years:** 1991 and 1993-1994
Number Involved: 1,800,000
Dates of Manufacture: August 1990 - June 1994
Defect: The lift gate support attaching bolts can break resulting in the lift gate falling unexpectedly, which could cause personal injury to someone standing under it.
Remedy: Dealers will inspect the lift gate support attaching bolts and install larger washers on the attaching bolts. Owner notification began during August 1999 with the 1991 model year vehicles and will be phased over the next several months for the 1993 and 1994 model year vehicles. Owners who do not receive the free remedy within a reasonable time should contact Chrysler at 1-800-992-1997.
[NHTSA Recall No. 99V213/Chrysler Recall No. 730]

DaimlerChrysler
Models: Jeep Grand Cherokee Year: 2000
Number Involved: 1,075
Dates of Manufacture: August 1999
Defect: Some steering gear units were assembled with internal end-of-travel-stops that missed the heat treat process, resulting in soft internal travel stops. This could result in sticking, binding, or seizing of the steering gear.
Remedy: Dealers will replace the steering gear on involved vehicles. Owner notification is expected to begin during December 1999. Owners who do not receive the free remedy within a reasonable time should contact Chrysler at
1-800-992-1997.
[NHTSA Recall No. 99V312/Chrysler Recall No. 854]

Ford Motor Company
Models: Ford F Super Duty Truck **Years:** 1999-2000
Number Involved: 17,000
Dates of Manufacture: January 1998 - August 1999
Defect: On certain trucks and chassis-cabs equipped with 5.4 liter manual transmission power trains, the accelerator cable core wire can wear the cable conduit end fitting. This could also lead to wear or separation of strands of the core wire, which could prevent the throttle from returning to the idle position. A "stuck" throttle could adversely affect vehicle control.
Remedy: Dealers will replace the accelerator cable and throttle body. Owner notification will begin November 9, 1999. Owners who do not receive the free remedy within a reasonable time should contact Ford at 1-800-392-3673.
[NHTSA Recall No. 99V265/Ford Recall No. 99S27]

Ford Motor Company
Models: Ford Windstar Year: 1995
Number Involved: 93,654
Defect: Minivans which were originally sold, or are currently registered, in the following hot weather states, Alabama, Arizona, Arkansas, California (10 southern counties), Florida, Georgia, Hawaii, Louisiana, Mississippi, Nevada (Clark County only), Oklahoma, South Carolina and Texas, can develop cracks in the fuel tank in the forward strap area of the standard 20-gallon tank due to a combination of factors that are present in certain very hot areas of the country. These cracks could result in fuel leakage if they propagate through the wall of the tank.
Remedy: Dealers will install a brace assembly at the strap bolt hole location and replace the tank strap with a revised, longer strap. Dealers will also inspect the tanks for leaks. If a leak exists and is the result of a crack in the fuel tank, the tank will be replaced in addition to the installation of the brace assembly and longer strap. Owner notification was expected to begin during December 1999. Owners who do not receive the free remedy within a reasonable time should contact Ford at 1-800-392-3673.
[NHTSA Recall No. 99V309/Ford Recall No. 99S33]

Ford Motor Company
Models: Ford Explorer Years: 1993-1995
Number Involved: 475,000
Defect: On certain sport utility vehicles, the hydraulic lift cylinder bracket welds could fracture. With a broken bracket weld, there is a potential for the lift gate bracket to gradually bend inward allowing the lift cylinder ball stud to disengage.
Remedy: Dealers will install lift gate reinforcement brackets. Depending upon the condition of the lift gate sheet metal in the area of the bracket, dealers may also install a larger reinforcement. Owner notification is expected to begin during January 2000. Owners who do not receive the free remedy within a reasonable time should contact Ford at 1-800-392-3673.
[NHTSA Recall No. 99V310.001/Ford Recall No. 99S34]

DaimlerChrysler Corporation
Models:
Jeep Cherokee Year: 1995; Jeep Grand Cherokee Years: 1994-1995
Number Involved: 334,047
Defect: The front disc brake rotors of passenger and multi-purpose vehicles originally sold or currently registered in Connecticut, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, or Wisconsin, and the District of Columbia, can experience severe corrosion if operated for an extensive period in the "salt belt." If the rotors are not replaced, the corrosion can eventually compromise the structural integrity of the stamped steel center hub section of the rotor. The reduced strength can allow the cast iron wear surface to separate from the hub, reducing the brake effectiveness of the vehicle.
Remedy: Dealers will replace these rotors with rotors with a stainless steel center section and which are coated with corrosion protection. Owner notification began Dec. 20, 1999. Owners who do not have their vehicles replaced within a reasonable time should contact Chrysler at 1-800-992-1997.
[NHTSA Recall No. 99V340/Chrysler Recall No. 747]

AM General Corporation
Models: AM General Hummer Years: 1999-2000
Number Involved: 980
Dates of Manufacture: July 1998 - September 1999
Defect: A potential chafing condition occurs between the flexible brake lines which connect the master cylinder to the ABS modulator on these sport utility vehicles. This condition can lead to one or both of the brake lines developing a brake fluid leak, causing a reduction in brake line pressure and resulting in longer-than-normal stopping distances.
Remedy: Dealers will replace the master cylinder to ABS modulator lines. The manufacturer reported that owner notification would begin during February 2000. Owners who do not receive the free remedy within a reasonable time should contact AM General at 1-734-523-8000.
[NHTSA Recall No. 00V005/AM General Recall No. AMG-R0001]

SCHOOL BUSES, MEDIUM/HEAVY DUTY TRUCKS AND TRAILERS
Freightliner Corporation
Models:
Freightliner MT45 **Years:** 1995-1999
Freightliner MT55 **Years:** 1995-1999
Number Involved: 14,000
Dates of Manufacture: February 1995 - April 1999
Defect: The throttle cable can bind due to misalignment with the fuel pump lever.
Remedy: Dealers will realign the cable bracket and inspect/replace the throttle cable and ball joint. Owner notification began Oct. 27, 1999. Owners who do not receive the free remedy within a reasonable time should contact Freightliner at 1-800-547-0712.
[NHTSA Recall No. 99V255/Freightliner Recall No. FL-244]

Navistar International Transportation Corporation
Models: Navistar 4000 **Years:** 1997-1999
Number Involved: 2,497
Dates of Manufacture: June 1997 - September 1999
Defect: The parking brake hose chafes at various points through the routing of the hoses to and from the hand control valve. If this occurs, the parking brake will automatically if pressure is lost due to a ruptured park brake hose increasing the risk of a vehicle crash.
Remedy: Dealers will install a hose routing kit to prevent chafing and replace all chafed hoses. Owner notification began Oct. 11, 1999. Owners who do not receive the free remedy within a reasonable time should contact Navistar at 1-800-448-7825.
[NHTSA Recall No. 99V261/Navistar Recall No. 99507]

Navistar International Transportation Corporation
Models:
Navistar 3400 **Year:** 1999; Navistar 3800 **Year:** 1999
Navistar 4700 **Year:** 1999; Navistar 4900 **Year:** 1999
Number Involved: 4,495
Dates of Manufacture: December 1998 - May 1999
Defect: The rear hydraulic hoses may be an improper length on certain heavy duty trucks built with rear leaf spring suspensions and manufactured from Feb. 28 through April 14, 1999; Models 4700 built with rear leaf suspensions and manufactured from Dec. 9, through December 16, 1998; Models 3400 and 3800 built with 14SBK rear leaf spring suspensions and built April

14 through May 10, 1999; and Models 3400 and 3800 built with rear leaf spring suspensions and manufactured from May 10 through May 18, 1999. Where the frame to axle hose length is too long, a chafing condition can occur on suspension components, which could result in hose rupture. On vehicles where the hoses are too short, a hose separation could occur with severe suspension articulation.
Remedy: Dealers will replace the short hoses and the long hoses will have a hose routing kit installed to prevent any chafing problems. Owner notification began Oct.11, 1999. Owners who do not receive the free remedy within a reasonable time should contact Navistar at 1-800-448-7825.
[NHTSA Recall No. 99V262/Navistar Recall No. 99508]

Blue Bird Body Company
Models: Blue Bird TC2000 **Year:** 1998
Number Involved: 2,100
Defect: On certain front engine buses equipped with Cummins ISB engines. The electrical power cables may not have been routed properly from the alternator output to the starting motor. If the cables are not routed properly, the cable insulation could be abraded by contact with other chassis components, causing an electrical short. The electrical short could cause an engine compartment fire.
Remedy: Dealers will add a harness clip and reroute the electrical power cable from the alternator output to starting motor. Any cables found with abrasions will be replaced. Owner notification began during November 1999. Owners who do not receive the free remedy within a reasonable time should contact Blue Bird at 1-912-825-2021.
[NHTSA Recall No. 99V289/Blue Bird Recall No. R99DF]

General Motors Corporation
Models:
Chevrolet C6 Year: 1999; Chevrolet C7 Year: 1999; Chevrolet B7 Year: 1999
GMC C6 Year: 1999; GMC C7 Year: 1999; GMC B7 Year: 1999
Number Involved: 391
Dates of Manufacture: January 1999
Defect: Medium duty conventional cab trucks and B7 school bus chassis equipped with an automatic transmission may have transmission shift cable end rods that have not been crimped to the proper specification. Over time, the shift cable could be pulled out of the rod end causing the driver to lose the ability to manually change transmission gears. With this condition, the vehicle may move in a direction not anticipated by the driver.
Remedy: Dealers will install a new shift cable. Owner notification began Nov. 30, 1999. Owners who do not receive the free remedy within a reasonable time should contact Chevrolet at 1-800-222-1020 or GMC at 1-800-462-8782.
[NHTSA Recall No. 99V320/GM Recall No. 99040]

Freightliner Corporation
Models:
Freightliner Century **Years:** 1998-1999; Freightliner Argosy **Years:** 1998-1999
Freightliner FLD **Years:** 1998-1999; Freightliner FLN **Years:** 1998-1999
Number Involved: 2,976
Dates of Manufacture: October 1998 - October 1999
Defect: On certain heavy-duty trucks, the outboard bearing on the steering axle hubs can fail due to water intrusion through a hubcap vent, resulting in a separation of the wheel.

Remedy: Dealers will remove the hubcap and inspect for water intrusion and corrosion. The hub and bearing assembly will be replaced if there is evidence of corrosion. A non-vented hubcap will be installed. Owner notification is expected to begin during December 1999. Owners who do not receive the free remedy within a reasonable time should contact Freightliner at 1-800-547-0712.
[NHTSA Recall No. 99V295/Freightliner Recall No. FL-246]

TIRES
Continental General Tire, Inc.
Models: General 295/75R225
Number Involved: 4,750
Dates of Manufacture: December 1998 - February 1999
Defect: Certain S380A 295/75R22.5 LR G tires, manufactured from December 1998 February 1999, Serial Nos. A3371E5488 through A3371E5089, are experiencing deflation as a result of stress splits or cracks beginning at the point of attachment of the sidewall to the square bead wire bundle, with resulting damage to the tire ply.
Remedy: Dealers will replace these tires. Owner notification began during September 1999. Owners who do not receive the free replacement tires within a reasonable time should contact Continental General at 1-800-726-7113.
[NHTSA Recall No. 99T008]

PROBLEM: TACOM-WARREN HAS RECEIVED A FLEET MANAGEMENT NEWSLETTER WHEREIN CATERPILLAR INC. IS INITIATING A SAFETY PROGRAM FOR THE INSPECTION/REPAIR OF 3116 ENGINES MANUFACTURED IN APRIL 1996 THROUGH MARCH 1998.

A. A link to the governor is joined to the control rod using a rivet, which can loosen, then wear and eventually fall out resulting in loss of engine speed control.

B. Early signs of a potential failure are indicated by low idle instability, engine dying from low idle or engine surge under operational loads. There should be no sudden changes of vehicle speed or loss of vehicle control, as vehicle steering and braking would continue to function. Should the above warning signs appear the vehicle should be shutdown until inspection and repair can be accomplished.

C. In the event of a worst case scenario (wherein the rivet totally separates from the control rod), engine speed control would be lost while engine rpm should remain virtually constant, based on load. Drivers are instructed to shift into neutral, brake/steer off the road, shutoff the master power switch and apply parking brake, if the vehicle remains running, move away from the vehicle and contact unit maintenance. Attempting to stall engine at high rpm may result in injury or death to personnel.

3. User actions:

Units with 3116 mechanically unit injected diesel engines with the below listed serial numbers are required to identify those vehicles (within 7 days) and schedule inspection by an authorized Caterpillar dealer IAW the following procedures:

A. ESP users need to open the hood and check the engine data plate on the valve cover at the front of the engine for serial numbers in the following range:

S/n #5rm01263 thru #5rm04201

B. FMTV users need to raise the cab (per TM 9-2320-365-10/page 2-164 for LMTV and TM 9-2320-366-10-1/page 2-242 for MTV) and check the engine data plate on the valve cover at the front of the engine for serial numbers in the following ranges:

S/N #3RJ01653 thru #3RJ02990

S/N #7AG02806 thru #7AG05461

Vehicles equipped with engines within the specified serial number range, which have accumulated more than 10,000 miles, must be inspected and repaired as necessary, within 60 days of this message. If vehicles have not been inspected/repaired within 60 days, they will be deadline until the inspection/repair is complete. All remaining vehicles (those equipped with engines within the specified serial number range which have accumulated less than 10,000 miles) must be inspected and repaired as necessary within 180 days of this message. Vehicles in this mileage category, which have not been inspected/repaired within 180 days, will be deadline until inspection and repair are complete. Also, vehicles in this category that reach 10,000 miles during this effort will revert to a 60 day inspection/repair period beginning the date mileage is reached but not to exceed the original 180 day timeframe. In either case, vehicles with the highest accumulated mileage should be given priority for inspection/repair. Units are instructed to contact their local caterpillar dealer to schedule an inspection. Information, which must be provided to the caterpillar dealer includes: vehicle serial number, engine serial number and vehicle mileage. If further/additional information is needed or if the local dealer is non-responsive, the following Caterpillar representatives may be contacted for assistance:

Len Anderson (309) 578-4562 or Bob Williams (309) 578-6143

MODEL: M998A2 Series and MI113,Mlll4,Mlll6,and MI123 Model Vehicles

SUBJECT: Troubleshooting and Repair of Serpentine Belt and Bracket System

DEFICIENCY: Because of reported failures with serpentine belt and bracket system, we have developed improved troubleshooting and repair procedures.

COMMENTS: The following procedure is provided for interim field use until publications can be updated to cover troubleshooting and repair of the serpentine belt and bracket system.

MATERIALS/PARTS:

PART **NO.**	NOMENCLATURE	()TY
IAW ASTM B 209	Aluminum, Flat Sheet .125 x 2.57 x 3.50 inches	I
IAW ASTM B 221	Aluminum, Rectangle, .125 x.75 x 24.00 inches	1

PROCEDURE

NOTE

Perform all steps in this procedure if a serpentine belt is found to have damage or is coming off pulleys. Do not stop performing troubleshooting steps if a problem is found; there may be more than one problem in the serpentine belt and bracket system.

A. Serpentine Belt Removal.

1. Raise and secure hood. (Refer to TM 9-2320-280-10 or TM 9-2320-387-10.)
2. Disconnect battery ground cable. (Refer to TM 9-2320-280-20 or TM 9-2320-387-24.)
3. Install 3/8-in. drive breaker bar on belt tensioner (7) and move tensioner (7) clockwise to loosen serpentine belt (9) as shown in figure 1.
4. Remove serpentine belt (9) from power steering pulley (3), alternator pulley (2), water pump pulley (4), crankshaft pulley (5), air conditioning compressor pulley or idler pulley (8), two upper idler pulleys (1), and belt tensioner pulley (6). Release belt tensioner (7).
5. Check pulleys and pulley grooves for mud or debris. If mud or debris is present, clean pulley grooves with a wire brush.

B. Pulley Alignment Tool Fabrication.

NOTE

* Procedures for fabricating pulley alignment tool are the same as published in TB 43-0001-62-6, **July** 98.
* If alignment tool has been previously fabricated, go to para. C.

1. Cut all material to size as shown in figure 2.

2. Position 24.00 in. rectangle aluminum, on top of aluminum flat sheet as shown in figure 3.

3. Check all measurements before and after welding, riveting, or bolting alignment tool together, then assemble as shown in figure 3.

C. Pulley Alignment.

NOTE

Not all vehicles are equipped with power steering pulley flange. If vehicle has one installed, perform step 1. If vehicle does not have pulley flange installed, proceed to step 2 and install new power steering pulley flange in step 25.

1. Remove two screws (5), lockwashers (4), washers (3), and power steering pulley flange (1) from power steering pulley (2) as shown in fig. 4.

NOTE

Ensure tab of pulley alignment tool is seated flush against back side of crankshaft pulley as shown in figure 5.

2. Position tab (1) of pulley alignment tool (5) behind crankshaft isolator pulley (6) and straight edge (4) of tool (5) across power steering pump pulley (2) and alternator pulley (3) as shown in figures 5 and 6.

NOTE

Power steering pump shaft has .025 in. end play and may allow power steering pump pulley to move back .025 in. from straight edge of alignment tool. This is acceptable.

3. Straight edge (4) of tool should seat against power steering pump pulley (2) and alternator pulley (3) as shown in figures 5 and 6. If pulley alignment is flush or meets above note specification, go to step 10. If pulley alignment is not flush, perform steps below.

4. Ensure power steering pulley (1) was installed on power steering pump (2) with flat surface (3) facing toward front of vehicle as shown in figure 8. Remove screw (5) and washer (4) and ensure power steering pulley (1) was installed flush with end of shaft (6) as shown in figure 8.

5. If power steering pulley (1) is not flush with end of shaft (6), use pulley installer to move power steering pulley (1) into position. If power steering pulley (1) will not move to flush position, remove pulley (1) and check for scoring on pulley (1) or shaft (6). Replace power steering **pulley (1)** if scored. Clean and repair shaft (6).

6. Using pulley installer, install power steering pump pulley (1) flush on end of shaft (6) and install washer (4) and screw (5) as shown in figure 8. Tighten screw (5) to 37 lb-ft (50 N.m).

7. Remove four screws (4), crankshaft isolator pulley (1), and spacer (3) from damper (2) and check for debris between crankshaft isolator pulley (1) and spacer (3), or failed rubber isolator as shown in figure 7. Clean or replace parts as necessary.

8. Apply NSN 8030-00-148-9833 sealing compound to thread of four screws (4) and install crankshaft isolator pulley (1) and spacer (3) on damper (2) with four screws (4) as shown in figure 7. Tighten screws (4) 48 lb-ft (65 N.m).

9. Check for loose screws (2) and (3) on alternator/power steering mounting bracket (1) as shown in figure 9. If all screws are tight and alignment tool will not fit behind crankshaft isolator pulley, remove and replace alternator/power steering mounting bracket (1) (refer to TM 9-2320- 387-24 or TM 9-2320-280-20), and recheck with alignment tool.

10. Check alignment of belt tensioner (3) to idler pulley (1) by placing a straight edge on pulley front face of belt tensioner (3) and to the side of idler pulley (1) or over the front face of pulley (1) as shown in figure 10. Face-to-face clearance must not exceed ± .060 in. as shown in figure 1 1. If clearance exceeds ± .060 in., replace idler pulley mounting bracket (2) (refer to TM 9-2320-387-24 or TM 9-2320-280-20), and recheck clearance.

NOTE

- There are two different configurations for vehicles without air conditioning. The original configuration can be identified by not having a spacer mounted between the rear of idler bracket and engine. On the original configuration, it is necessary to remove the idler pulley from the bracket to check bearing location and spacer. The updated configuration can be checked without removing idler pulley from bracket.
- Belt tensioner, idler pulleys, and mounting hardware shown in figure 12 are for vehicles without air conditioning. Idler pulley is used in place of A/C compressor shown in figures 17 and 18.
- Perform steps 11 and 12 for vehicles without air conditioning.

11. Check idler pulley (1) used on vehicles without air conditioning as shown in figure 12 by removing idler pulley (1). Check that bearing (2) is positioned in center of idler pulley housing (1) as shown in figure 13. Hold idler pulley (1) as shown in figure 14, rotate spacer (2) by hand, and look for side to side movement of spacer (2). Turn idler pulley (1) over and check other side of spacer (2) for movement. Replace idler pulley (1) if bearing (3) is not centered or movement is found on spacer (2).

12. Check two upper idler pulleys (2) and updated configuration idler pulley (3) for loose or noisy bearing, by pushing in and pulling out on idler pulleys (2) and (3) and rotating and listening for noise as shown in figure 12. Replace idler pulley if bearing is loose or noisy. (Refer to TM 9-2320-280-20 or TM 9-2320-387-24.)

13. Check alignment of two upper idler pulleys by placing a straight edge on the left front pulley face and over to right pulley front face as shown in fig.15. Face-to-face clearance must not exceed ± 0.125 in. Replace idler pulley bracket if not within limits. (Refer to TM 9-2320-387-24 or TM 9-2320-280-20.)

14. Check for alignment of the top two idler pulleys by placing a straight edge on top of pulleys and checking if straight edge rocks from side-to- side as shown in figure 16. Replace idler pulley bracket if pulleys are not in line. (Refer to TM 9-2320-280-20 or TM 9-2320-387-24.)

NOTE

- There are two different configurations used for A/C compressor mounting bracket.
- Omit steps 15 through 19 for vehicles without air conditioning.
- If you have original configuration which has welded bracket and spacer as shown in figure 17, perform steps 15 and 16 and reinstall spacer, then proceed to step 19. If you have updated configuration which has a 1-in. thick adapter plate mounted to cylinder head as shown in figure 18, perform steps 17 and 18 and reinstall spacer, then proceed to step 19.
- It is necessary to remove attaching hardware to check spacer. After checking spacer, use existing hardware to install spacer.

15. Remove nut (5), lock washer (4), and screw (1) to pull out spacer (2) from between A/C compressor (6) and weld bracket (3) on original configuration as shown in figure 17.

16. The original configuration, as shown in figure 17, has a welded bracket (3) and spacer (2) with overall length of 2.575 ±.010 in. If spacer (2) is too long, grind length to 2.575 ±.010 in. If spacer is short, it must be replaced. Use existing hardware to reinstall spacer (2).

17. Remove screw (1), lock washer (2), and washer (3) to pull out spacer (4) from between A/C compressor (6) and adapter plate (5) on updated configuration as shown in figure 18.

18. The updated configuration, as shown in figure 18, has a 1.00-in. thick adapter plate (5) mounted to cylinder head and spacer (4) has a length of 1.825 ± .010 in. If spacer (4) is too long, grind to 1.825 ± .010 in., or replace if too short. Use existing hardware to reinstall spacer (4).

19. Spin A/C compressor (6) clutch bearing, and check for noise, loose bearing, and signs of grease coming from bearing as shown in figures 17 or 18. Replace or repair A/C compressor as necessary. (Refer to TM 9- 2320-387-24 or TM 9-2320-280-20.)

20. Check serpentine belt for cracks, fraying, or tears. Replace serpentine belt if damaged or serpentine belt has come off at any time. (Refer to TM 9-2320-280-20 or TM 9-2320-387-24.)

21. Inspect belt tensioner for broken stop. Replace belt tensioner if stop is broken. (Refer to TM 9-2320-280-20 or TM 9-2320-387-24.)

22. Install serpentine belt (9) as shown in figure 1, and ensure belt (9) engages in all pulley grooves.

23. Connect battery ground cable. (Refer to TM 9-2320-280-20 or TM 9-2320- 387-24.)

24. Start engine and idle for a few minutes. Check that serpentine belt (9) is tracking good on all pulleys.
25. Apply sealing compound to threads of screws (5) and install power steering flange (1) on power steering pulley (2) with two washers (3), new lock washers (4), and screws (5) as shown in figure 4.
26. Lower and secure hood. (Refer to TM 9-2320-280-10 or TM 9-2320-387-10.)

PUBLICATIONS AFFECTED: TM 9-2320-280-20 TM 9-2320-387-24

LEVEL OF MAINTENANCE: Unit

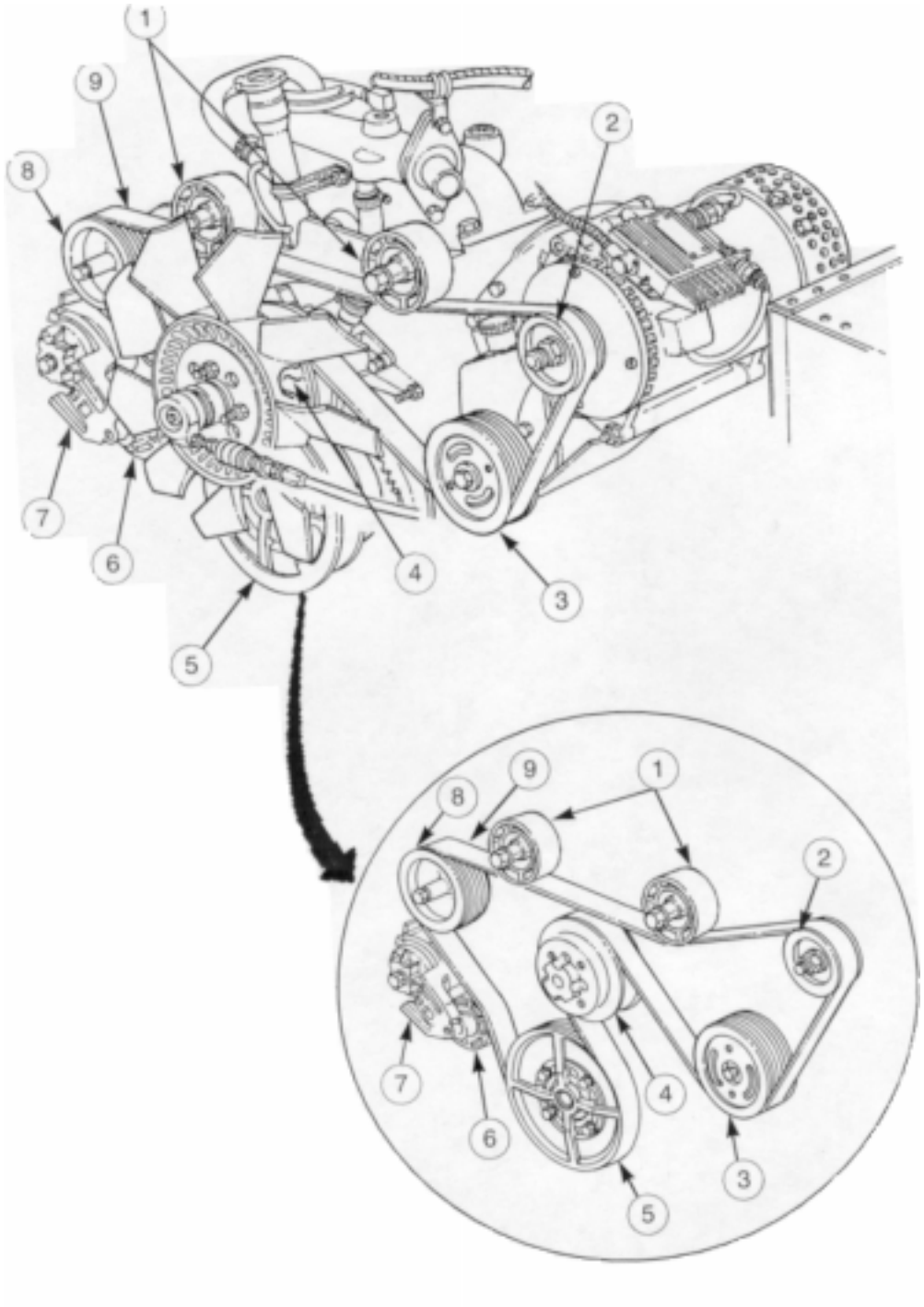


Figure 1

NOTES:

1. ALL DIMENSIONS ARE IN INCHES

0 MATERIAL: ALUMINUM, FLAT SHEET,
IAW ASTM B 209.125 X 2.57 X 3.50

MATERIAL: ALUMINUM, RECTANGLE,
C)IAW ASTM B 221.125 X.75 X 24.00

4. CUT FLAT SHEET 2 AS SHOWN

5. REMOVE ALL BURRS AND SHARP EDGES

6. SEE FIGURE 3 FOR ASSEMBLY OF ALIGNMENT TOOL

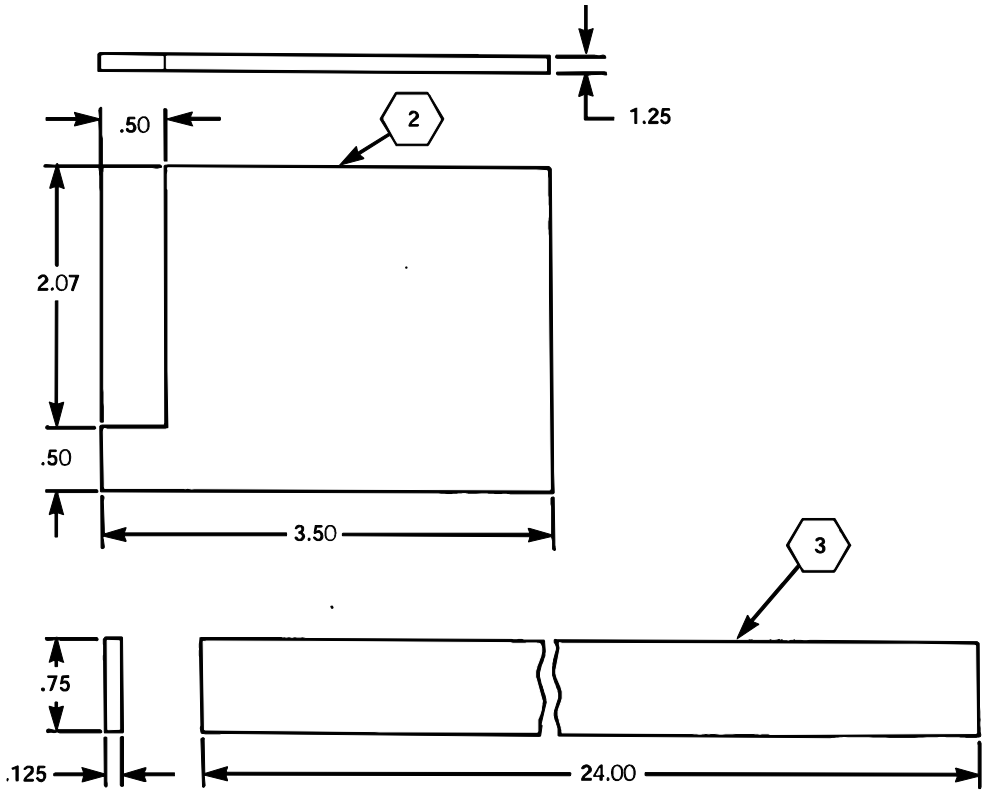


Figure 2

NOTES:

1. ALL DIMENSIONS ARE IN INCHES
2. ALIGNMENTTOOL,CANBEASSEMBLEDUSINGNUTS,BOLTS,RIVETS,ORBYWELDINGTHE .75 X 24.00 RECTANGLE TO TOP OF FLAT SHEET AS SHOWN
3. THE MOST CRITICAL DIMENSION IS 1.320±.005 AS SHOWN

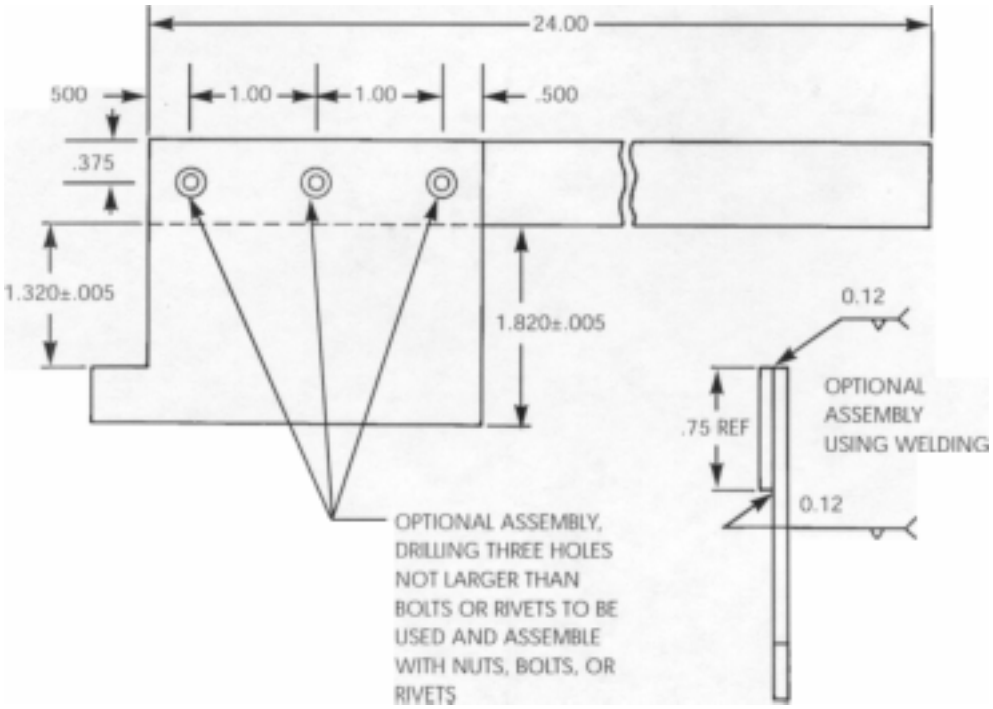


Figure 3

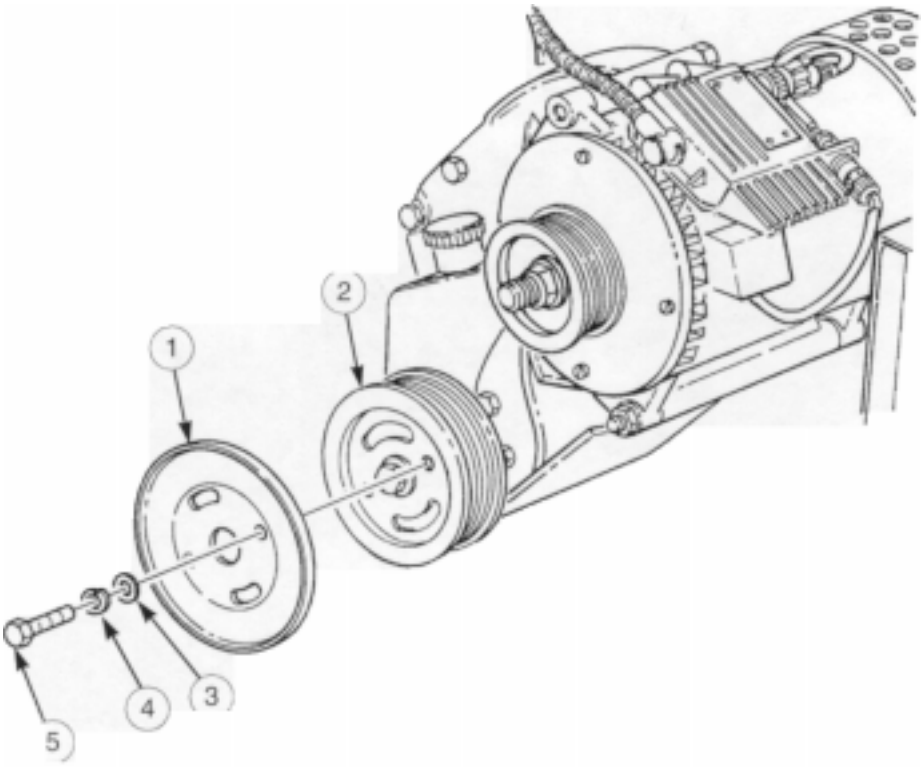


Figure 4

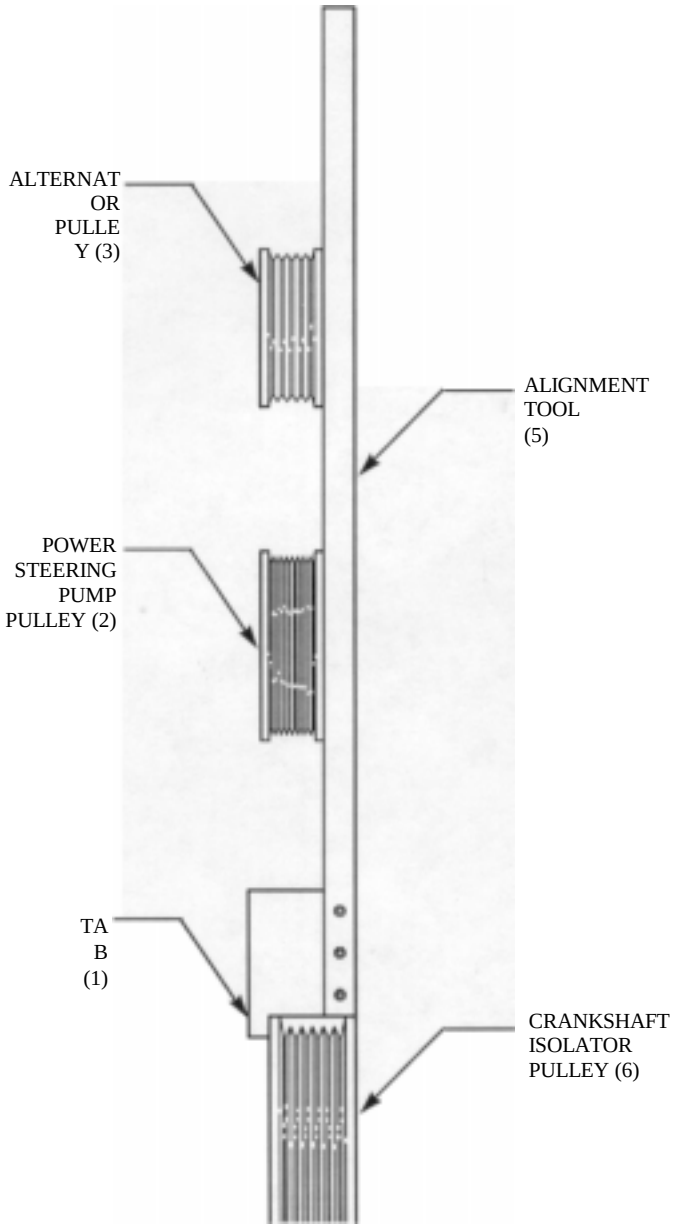
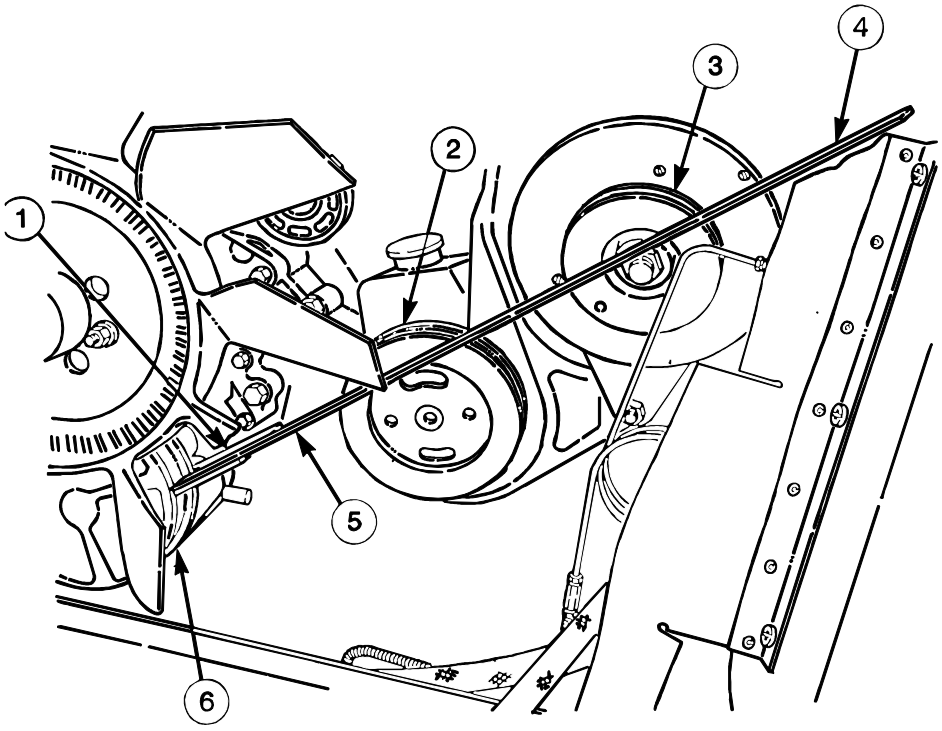
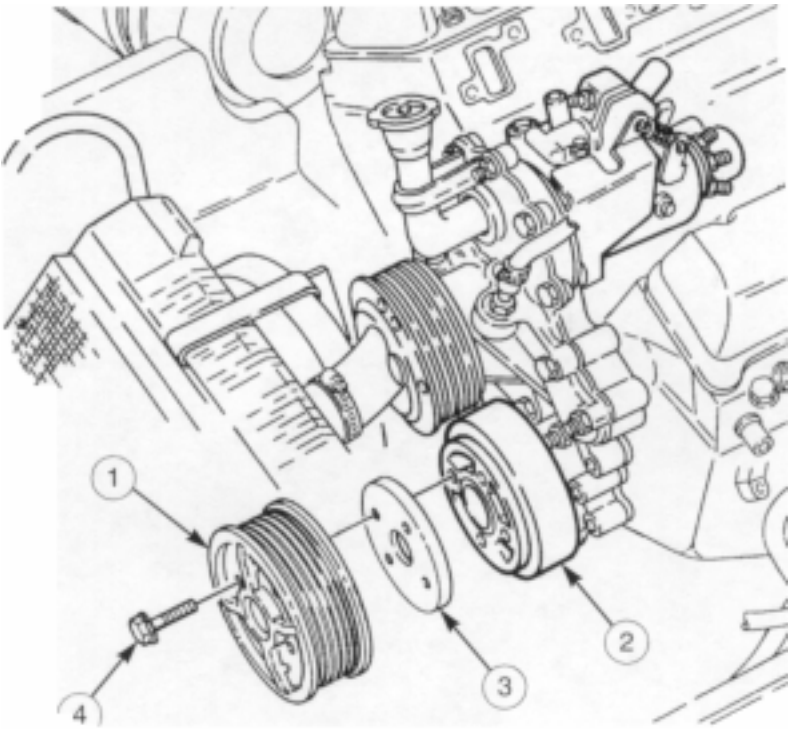

ALTERNAT
OR
PULLE
Y (3)
ALIGNMENT
TOOL
(5)
POWER
STEERING
PUMP
PULLEY (2)
TA
B
(1)
CRANKSHAFT
ISOLATOR
PULLEY (6)

Figure 5



Figure



Figure

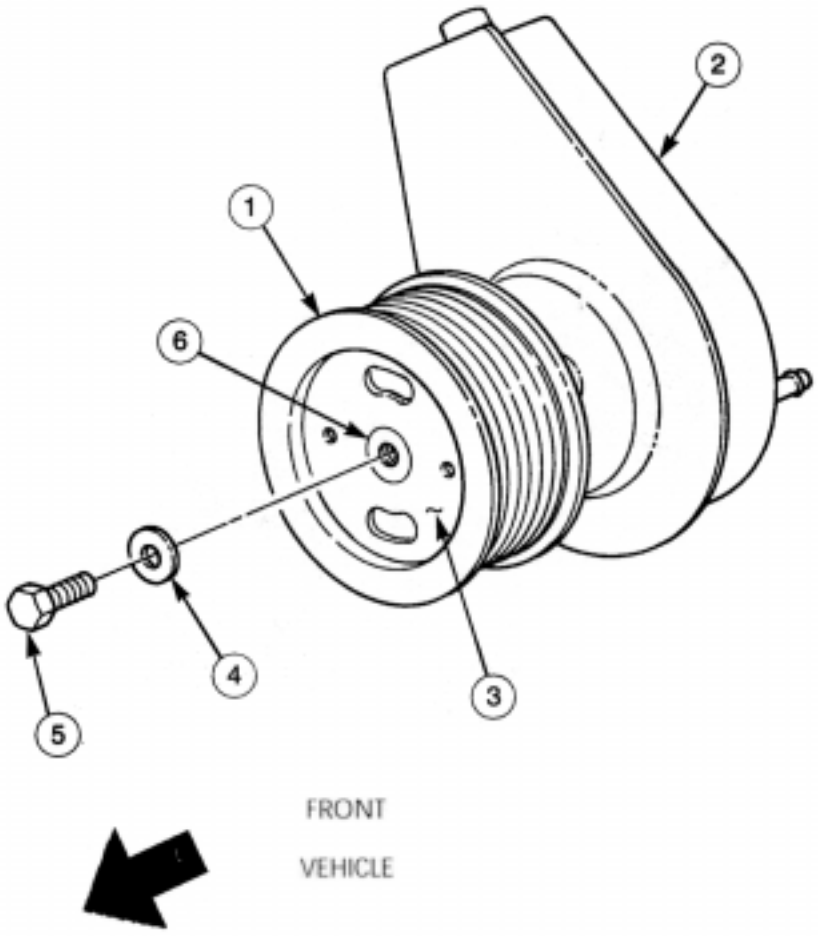


Figure 8

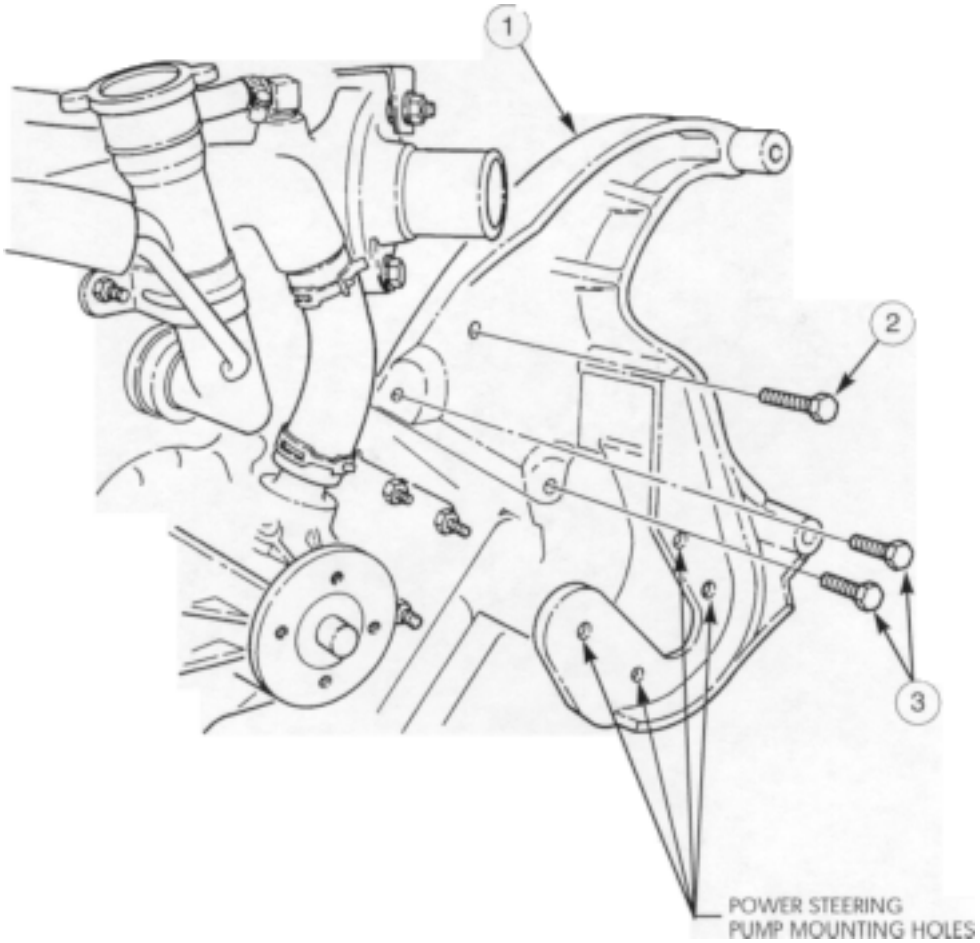
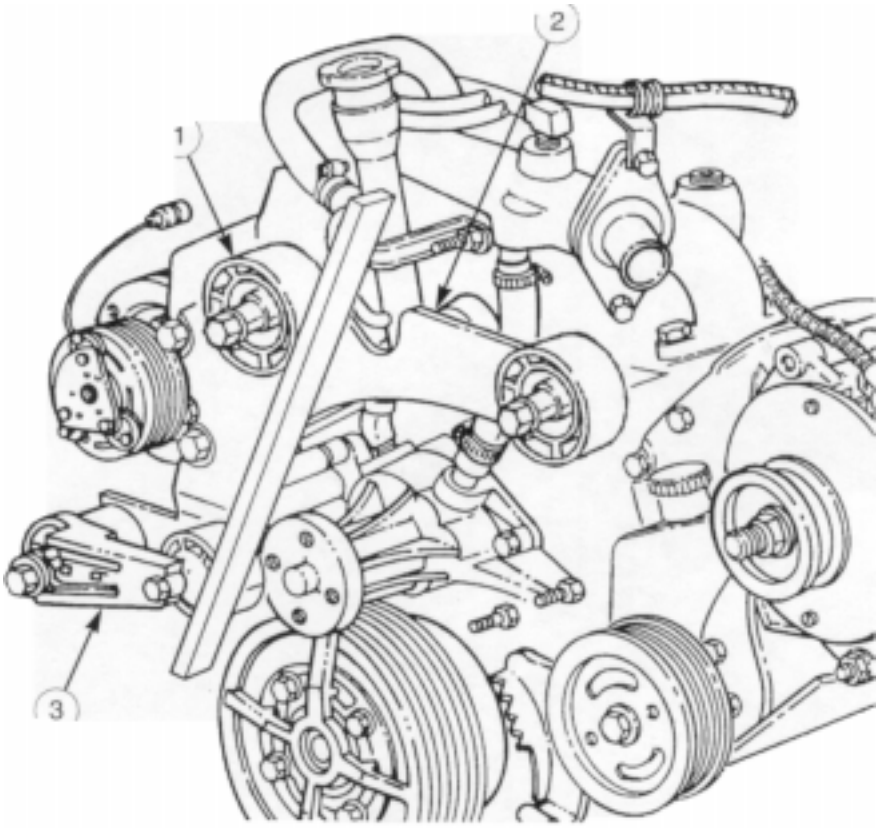
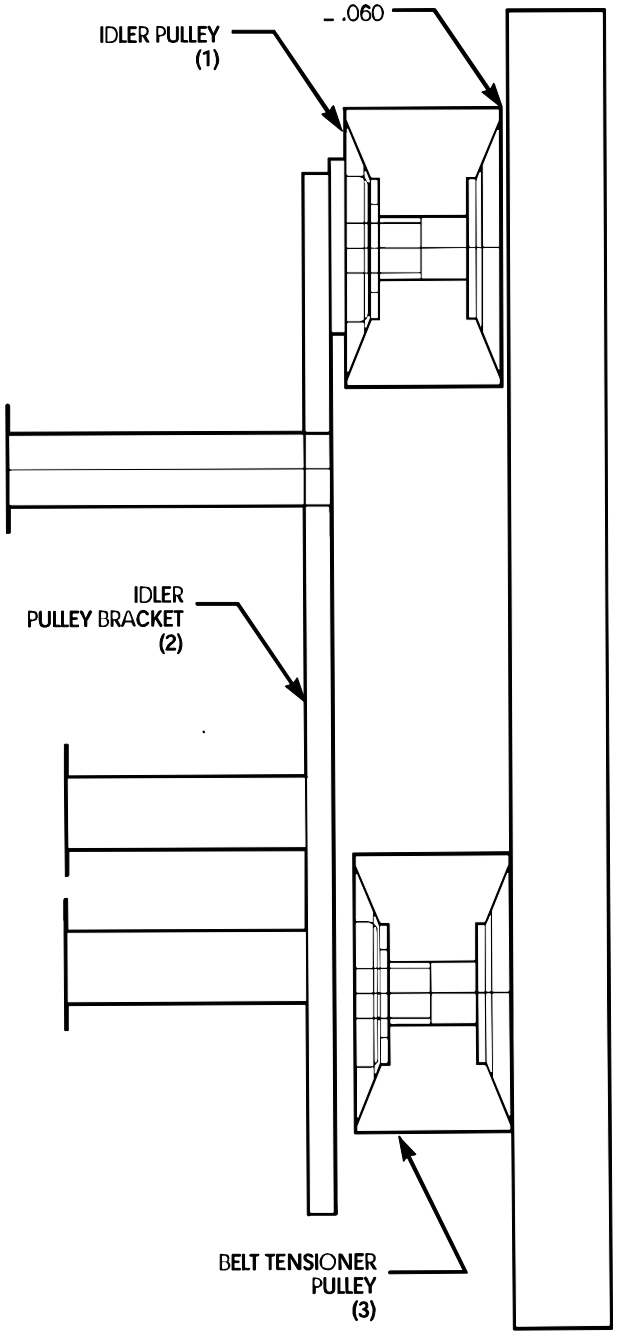
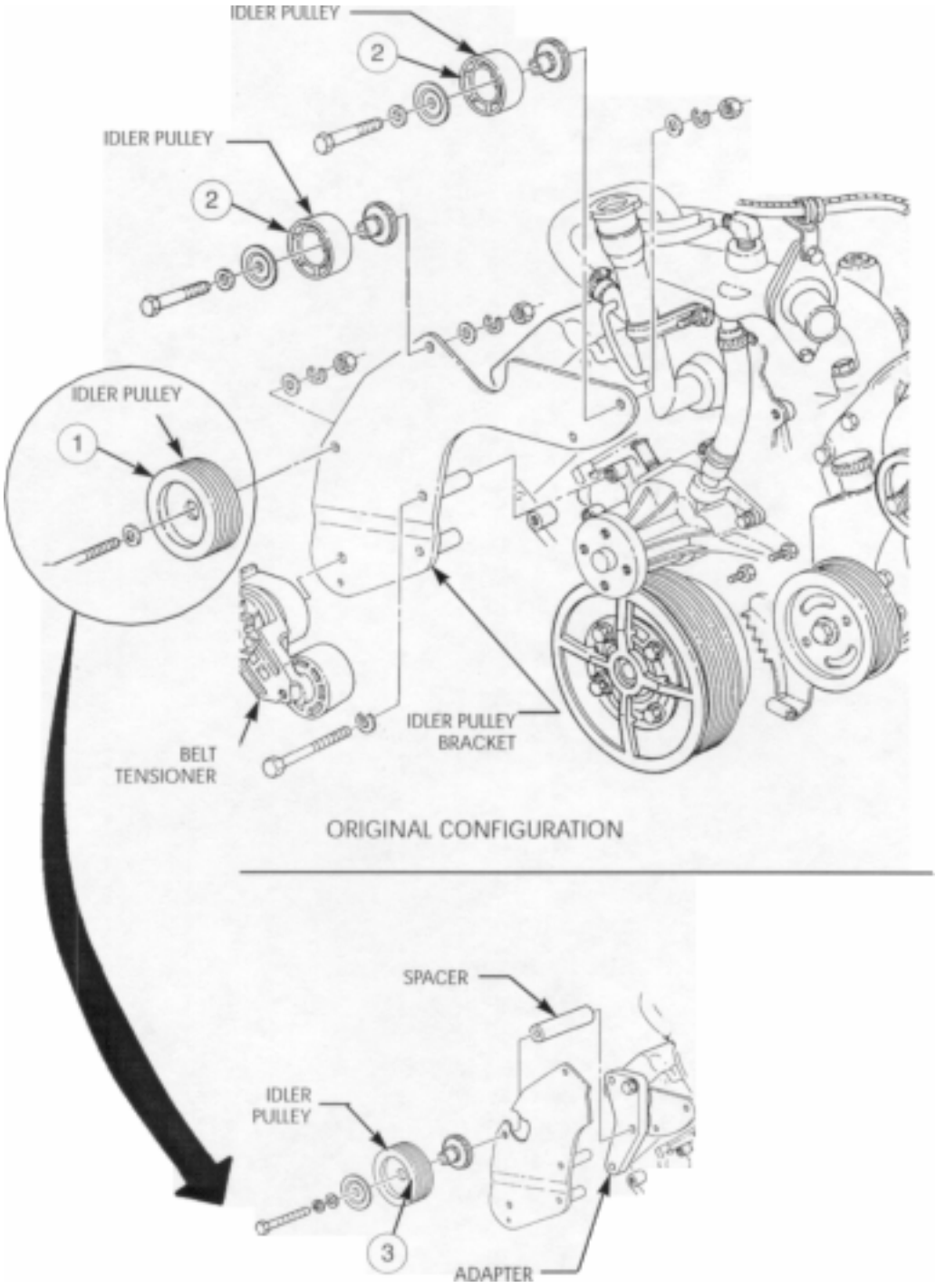


Figure 9

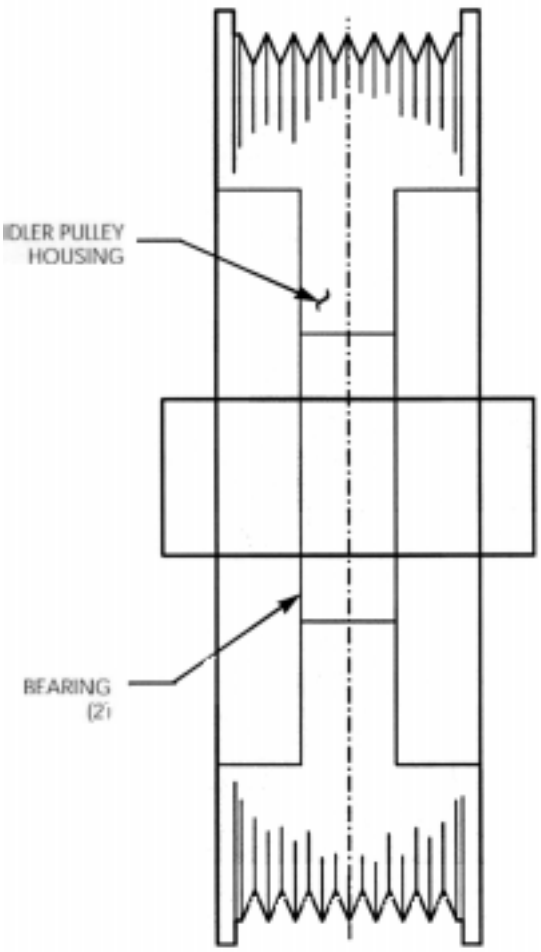


Figure

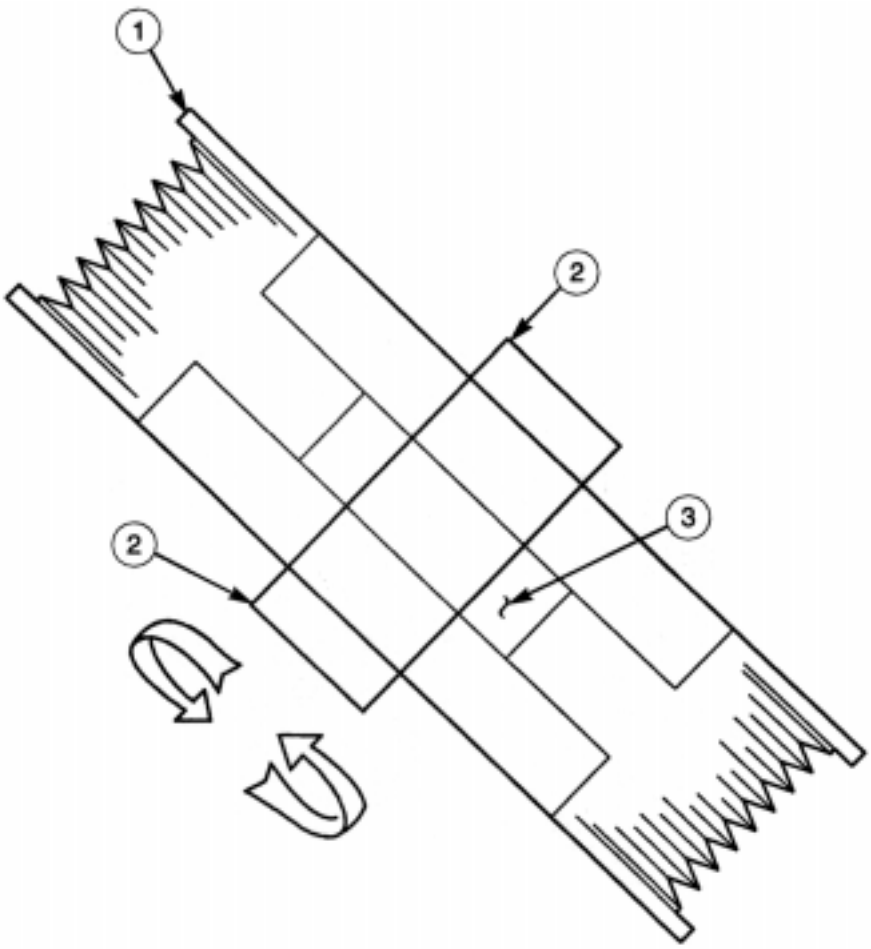

IDLER PULLEY
(1)
.060
IDLER
PULLEY BRACKET
(2)
BELT TENSIONER
PULLEY
(3)



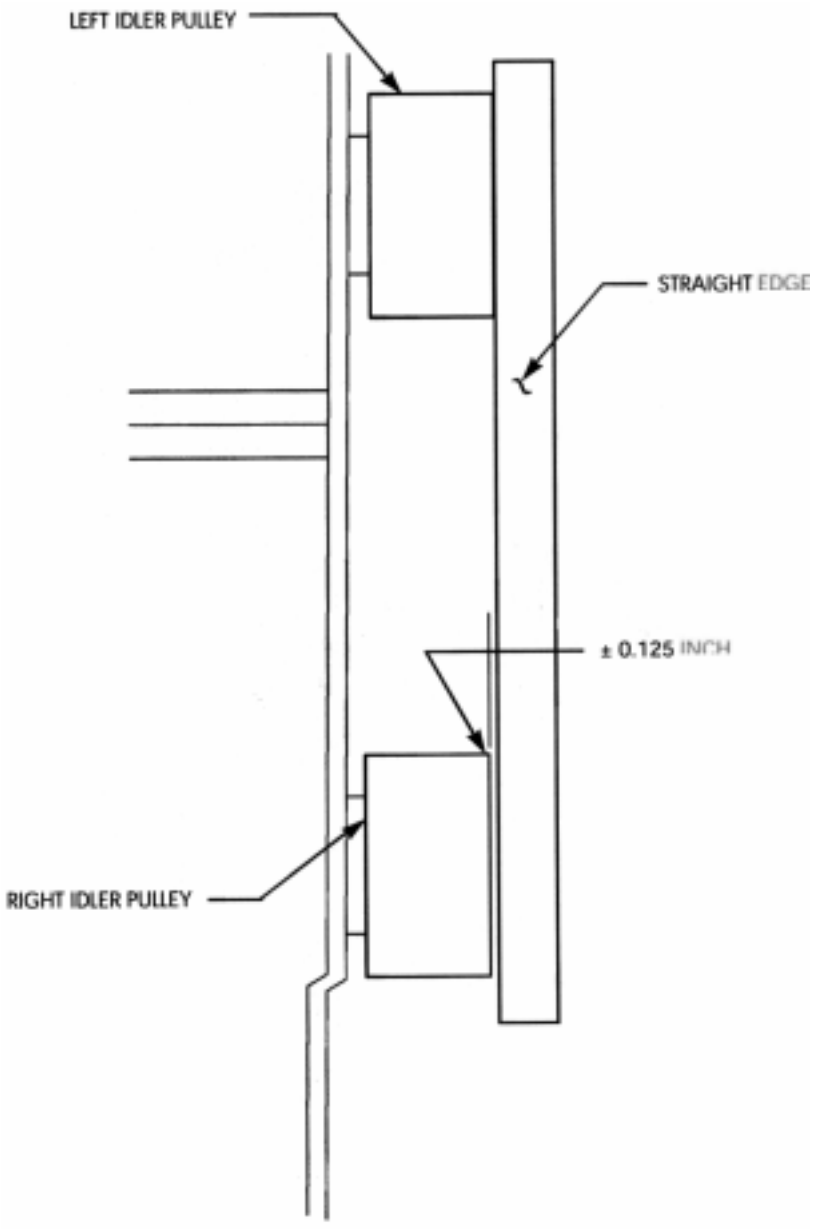
UPDATED
CONFIGURATION
Figure **12**



Figure



Figure


LEFT IDLER PULLEY
STRAIGHT EDGE
± 0.125 INCH
RIGHT IDLER PULLEY

Figure

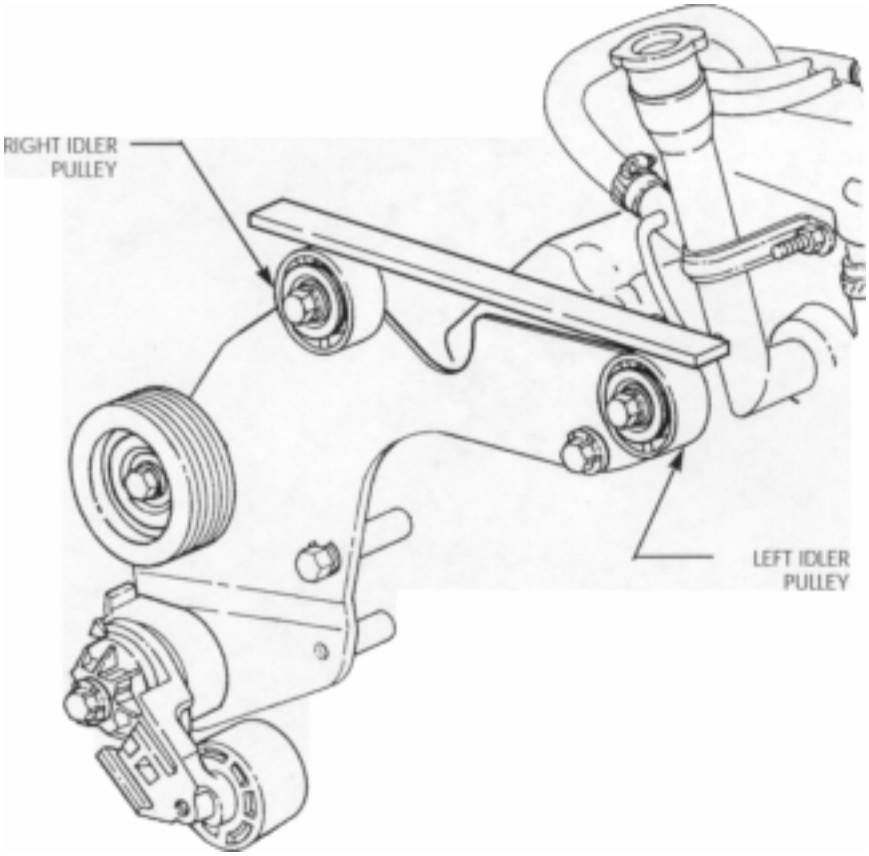
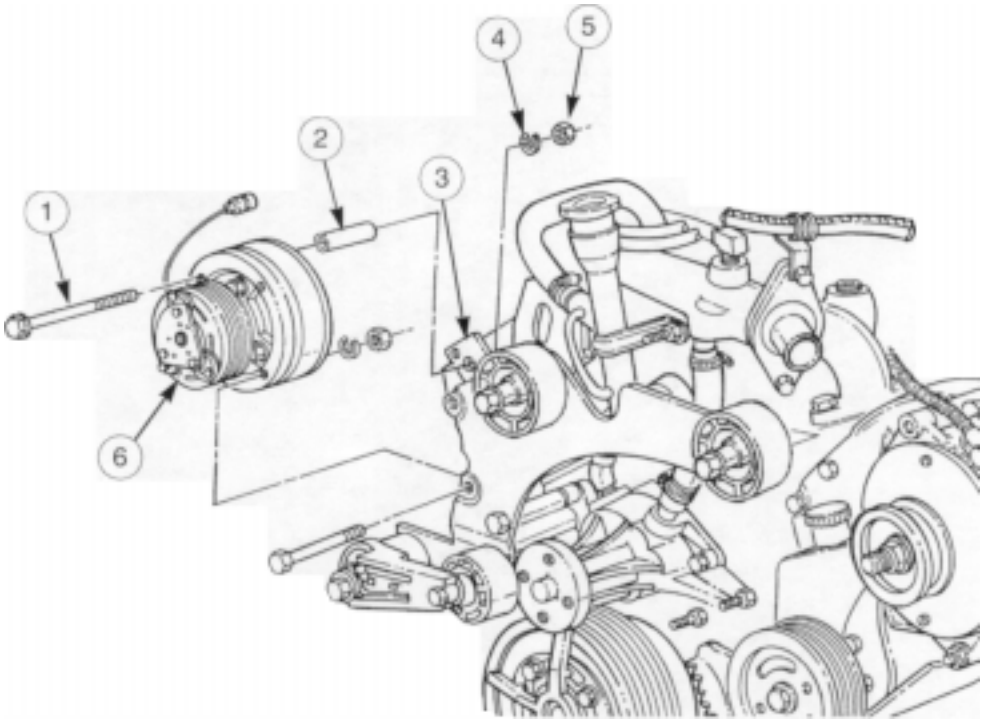
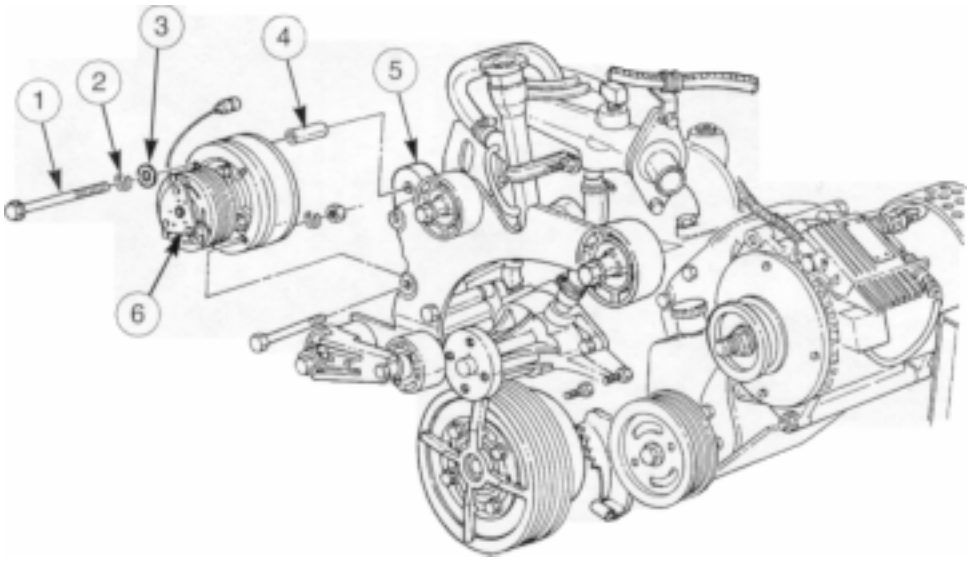


Figure 16



ORIGINAL
CONFIGURATION

Figure **17**



UPDATED
CONFIGURATION

Figure 18

COSAL CHANGES

APL	APL,CAGE P/N	NSN NOMENCLATURE	NEW QTY	UOI	MAINT LEVEL	1	2	3	4	5-8	9-20
0001 ADD	955020001 Cage 1K9C4 P/N HK-401	4730-LL-LRP-F038 REPAIR KIT HOSE	1	EA	OZ						
0001 ADD	955020001 Cage 1K9C4 P/N H-010-U	4730-LL-LRP-F039 MENDER HOSE	5	EA	OZ						
0001 ADD	955020001 Cage 1K9C4 P/N H-080-U	4730-LL-LRP-F041 MENDER HOSE	5	EA	OZ						
0001 ADD	955020001 Cage 1K9C4 P/N H-060-U	4730-LL-LRP-F042 MENDER HOSE	5	EA	OZ						
0002 ADD	955020001 Cage 1K9C4 P/N HK-401	4730-LL-LRP-F038 REPAIR KIT HOSE	1	EA	OZ						
0002 ADD	955020001 Cage 1K9C4 P/N H-010-U	4730-LL-LRP-F039 MENDER HOSE	5	EA	OZ						
0002 ADD	955020001 Cage 1K9C4 P/N H-012-U	4730-LL-LRP-F040 MENDER HOSE	5	EA	OZ						
0002 ADD	955020001 Cage 1K9C4 P/N H-080-U	4730-LL-LRP-F041 MENDER HOSE	5	EA	OZ						
0002 ADD	955020001 Cage 1K9C4 P/N H-060-U	4730-LL-LRP-F042 MENDER HOSE	5	EA	OZ						
0001 ADD	955010001 Cage 98171 P/N 9999039	2530-01-084-6975 PLUG CHAMBER TOP	10	EA	HZ	10	20	30	40	60	150
6384 ADD	950086384 Cage 75160 P/N T23526	3030-01-231-7066 BELT-V	1	EA	OZ	1	1	1	1	2	3
6346 ADD	950066346 Cage 64829 P/N AF3496	2940-01-152-3017 FILTER ELEMENT FLUID	1	EA	OZ	2	4	6	8	12	30
6346 ADD	950066346 Cage 79396 P/N 46233	2940-01-151-6291 FILTER ELEMENT INTAKE	1	EA	OZ	2	4	6	8	12	30
6270 ADD	950066270 Cage 19207 P/N 11664706	2910-00-421-3967 PUMP ENGINE PRIMING	1	EA	GZ	0	0	0	1	1	1
6270 DELETE	950066270	2910-01-268-8736 PUMP ENGINE PRIMING	0	EA							
5487 DELETE	950075487 Cage 66289 P/N 0647-84-200	2990-01-205-8797 MUFFLER	0	EA							
5731 DELETE	950075731 Cage 66289 P/N 0647-84-200	2990-01-205-8797 MUFFLER	0	EA							
5900 DELETE	950075900 Cage 66289 P/N 0647-84-200	2990-01-205-8797 MUFFLER	0	EA							
0001 ADD	95523001 Cage79470 P/N S320	4710-01-090-2075 TUBE ASSEMBLY METAL	4	EA	HZ	4	8	12	16	24	60
0001 ADD	955250001 Cage 56501 P/N 14RB8FX	5940-00-492-8333 TERMINAL	1	PG	HZ	1	1	1	1	1	1
0001 DELETE	955250001	0000-LL-CJ9-0714 TERMINAL	0	EA							

COSAL CHANGES

APL	APL,CAGE P/N	NSN NOMENCLATURE	NEW QTY	UOI	MAINT LEVEL	1	2	3	4	5-8	9-20
0002 ADD	955250002 Cage 56501 P/N 14RB8FX	5940-00-492-8333 TERMINAL	1	PG	HZ	1	1	1	1	1	1
0002 DELETE	955250002	0000-LL-CJ9-0714 TERMINAL	0	EA							
5762 5810 6356 6456 ADD	950365762 950365810 950366356 950366456 Cage 50340 P/N 13077	4540-01-356-0823 CONTROL,FLAME SAFEG	1	EA	GZ	1	1	1	1	1	1
5762 5810 6356 6456 DELETE	950365762 950365810 950366356 950366456	5945-01-233-9251 RELAY ELECTROMATIC	0	EA							
6073 ADD	950TM6073 Cage 89346 P/N F1950	7610-LL-W8A-7727 MANUAL SET	1	SE	OZ						
6073 DELETE	950TM6073 Cage 89346 P/N F1950	7610-LL-X8A-7727 MANUAL SET	0	SE	OZ						
6151 6167 6439 DELETE	950016151 950016167 950016439	5330-01-332-4125 GASKET	0	EA							
6382 DELETE	950076382	2990-01-388-5439 MUFFLER	0	EA							
6382 DELETE	950296382	5977-01-387-9216 BRUSH ELECTRICAL									
6382 DELETE	950306382	6110-01-388-0333 REGULATOR	0	EA							
6382 DELETE	950016382	5330-01-388-1549 GASKET SET	0	EA							
0001 0002 ADD	955250001 955250002 Cage 8134 P/NSN40WACP 3	3439-01-456-1681 SOLDER LEAD ALLOY	2	SL	HZ						
0001 0002 DELETE D	955250001 955250002	3439-00-184-8960 SOLDER LEAD ALLOY	0	SL							
5483 5486 5488 ADD	950095483 950095486 950095488 Cage 16764 P/N 10479611	2920-01-353-7036 STARTER ENGINE	1	EA	GG	0	0	0	1	1	1
5483 5486 5488 DELETE	950095483 950095486 950095488	2920-01-157-3765 STARTER ENGINE	1	EA							
5483 5486 5488 ADD	950065483 950065486 950065488 Cage 11862 P/N 25004137	6680-01-164-9433 TRANSMITTER LIQUID	1	EA	HZ	1	1	1	1	1	1
5483 CHANGE	950175483	2610-01-148-1634 TIRE PNEUMATIC			OZ	1	1	1	1	1	3

COSAL CHANGES

APL	APL,CAGE P/N	NSN NOMENCLATURE	NEW QTY	UOI	MAINT LEVEL	1	2	3	4	5-8	9-20
5486 5488 5661 5870 6428 CHANGE	950175486 950175488 950175661 950175870 950176428	2610-01-148-1634 TIRE PNEUMATIC			OZ	1	1	1	1	1	3
5292 DELETE	950335292	6685-00-598-1776 TEMP INDICATOR	0	EA							
5889 6593 DELETE	950TM5889 950TM6593	7610-LL-L26-2740 MANUAL	0	EA							
5889 6593 DELETE	950TM5889 950TM6593	7610-LL-L26-2760 MANUAL	0	EA							
5889 6593 ADD	950TM5889 950TM6593 CAGE 34623 P/N TM9232028024 P-1	7610-LL-L26-9710 REPAIR PARTS MANUAL	1	EA	O	1	2	2	2	3	4
5889 6593 ADD	950TM5889 950TM6593 CAGE 34623 P/N TM9232028024 P-2	7610-LL-L26-9720 REPAIR PARTS MANUAL	1	EA	O	1	2	2	2	3	4
5889 DELETE	950175889	9320-01-244-0046 TAPE ADHESIVE	0	RO							
5889 DELETE	950175889	2640-01-262-9517 LUBRICANT	0	PR							
5889 DELETE	950175889	7510-00-802-8311	0	RO							
5889 ADD	950175889	2640-01-419-6200 LUBRICANT RUN FLAT	2	EA	O	1	1	2	2	3	4
6539 6581 6591 CHANGE	950066539 950066581 950066591	2950-01-428-6594 TURBOCHARGER	0	EA	Z						
3667 3785 3933 3982 4030 4118 4223 4268 4269 4284 4523 4627 4735 ADD	95030-3667 3785 3933 3982 4030 4118 4223 4268 4269 4284 4523 4627 4735	5975-00-878-3791 ROD GROUND CAGE 81348 P/N W-R- 550A	1	EA	Z						

COSAL CHANGES

APL	APL,CAGE P/N	NSN NOMENCLATURE	NEW QTY	UOI	MAINT LEVEL	1	2	3	4	5-8	9-20
5185 5299 5444 5469 5489 5528 5545 5845 6062 6113 6137 6148 6255 6382 6405 6474 6475 6477 6505 6508 6616 ADD	95030-5185 5299 5444 5469 5489 5528 5545 5845 6062 6113 6137 6148 6255 6382 6405 6474 6475 6477 6505 6508 6616	5975-00-878-3791 ROD GROUND CAGE 81348 P/N W-R-550A	1	EA	Z						
5818 ADD	950175818 CAGE 80201 P/N 47697	5330-01-117-1014 SEAL PLAIN ENC	4	EA	G	0	0	0	0	0	1
5818 ADD	950175818 CAGE 60038 P/N 594A	3110-00-950-9700 CONE AND ROLLER BEARING	4	EA	G	0	0	0	0	0	1
2147 DELETE	950402147	5330-01-018-7135	0	EA							
5903 DELETE	950055903	3110-01-198-8411 BEARING	0	EA							
5903 ADD	950055903 CAGE 84243 P/N 127859X	3110-00-008-9177 BEARING BALL	1	EA	H	0	0	0	1	1	1
6571 DELETE	950016571	3120-01-188-0723 BEARING WASHER	0	EA							
6571 DELETE	950016571	3110-01-188-0727 BEARING BALL	0	EA							
6405 DELETE	950086405	5330-01-390-9291 GASKET	0	EA							
6405 DELETE	950096405	3110-01-392-5361 BEARING BALL	0	EA							
6533 CHANGE	950526533	5930-01-421-8258 SWITCH, THERMO	0	EA	Z						
6533 CHANGE	950336533	6645-01-422-5686 METER TIME	0	EA	Z						
6533 CHANGE	950336533	6685-01-422-9653 INDICATOR, TEMP	0	EA	Z						
6539 6581 6591 6602 CHANGE	950136539 950136581 950136591 950136602	3130-01-416-3108 BEARING UNIT	0	EA	Z						
6539 6581 6591 6602 CHANGE	950136539 950136581 950136591 950136602	3110-01-426-0020 BEARING	0	EA	Z						
6539 6602 CHANGE	950016539 950016602	3120-01-428-8850 BEARING SLEEVE	0	SE	Z						

COSAL CHANGES

APL	APL,CAGE P/N	NSN NOMENCLATURE	NEW QTY	UOI	MAINT LEVEL	1	2	3	4	5-8	9-20
5434 5470 6145 DELETE	950015434 950015470 950016145	3120-01-178-1865 BEARING SLEEVE	0	EA	Z						
5434 5470 6145 ADD	950015434 950015470 950016145	3120-00-240-8053 BEARING SLEEVE	3	EA	Z						
6124 ADD	950176124	2610-01-148-1635 TIRE PNEUMATIC	4	EA	O						
6124 DELETE	950176124	2610-01-154-3984 TIRE PNEUMATIC	0	EA	O						
6168 DELETE	950176168	2610-00-528-9686 TIRE PNEUMATIC	0	EA	H						
6168 ADD	950176168	2610-01-076-9414 TIRE PNEUMATIC	4	EA	H	0	0	1	1	1	2
0001 0002 DELETE	955240001 955240002	6850-00-598-7311 LEAK PREVENTION	0	BX							
0001 ADD	955240001	6850-00-849-4035 LEAK PREVENTIVE COMP	12	CN							
0002 ADD	955240002	6850-00-849-4035 LEAK PREVENTIVE COMP	6	CN							
0001 0002 DELETE	955010001 955010002	5330-00-467-3615 PAPER GASKET	0	FT							
0001 ADD	955010001	5330-00-105-0100 PAPER GASKET	3	EA	O	3	6	9	12	18	45
0002 ADD	955010002	5330-00-105-0100 PAPER GASKET	1	EA	O	1	2	3	4	6	15
6203 DELETE	950226203	2540-01-316-6624 COVER, FITTED	0	KT							
0001 DELETE	955090001	2640-00-138-8361 PLUG AND PATCH	0	BX							
0001 DELETE	955090001	2640-00-138-8356 PLUG AND PATCH	0	BX							
0001 DELETE	955090001	2640-00-138-8354 PLUG AND PATCH	0	BX							
0001 DELETE	955090001	2640-00-138-8346 PLUG AND PATCH	0	BX							
0001 DELETE	955090001	2640-00-138-8347 PLUG AND PATCH	0	BX							
0001 DELETE	955090001	2640-00-138-8350 PLUG AND PATCH	0	BX							
0001 DELETE	955010001	5330-00-224-0868 PACKING MATERIAL	0	LB							
0001 ADD	955010001	5330-01-132-2496 PACKING MATERIAL	5	FT	H	5	10	15	20	30	75